

REMARKS

Claims 1-37 are pending in the application. Claims 1, 17 and 28 are independent claims. The specifications have been amended to correct a typographic error noted by the Examiner.

Claim 1 has been broadened by replacing the term "resistivity sensor" with the broader term "first sensor". New claim 38 is dependent upon claim 1 and includes a resistivity sensor. Claim 1 has also been amended in (b) by addition of the term "spatial" to distinguish the position therein from the plurality of rotational positions in (a). Claim 1 also includes a determination of a parameter of interest of a bed boundary away from the borehole. Support for this element is found in Figs. 5a, 5b, 5c, 6a and 6b.

Claims 2, 7, 9, 14 and 15 have been amended consistent with the amended language of claim 1.

Claim 6 has been amended to correct a grammatical error.

Claim 17, and independent claim, has been broadened by replacing the term "resistivity sensor" with the broader term "first sensor." New claim 39 is dependent upon claim 17 and includes a resistivity sensor. Claim 17 has also been amended in (c) by addition of the term "spatial" to distinguish the position therein from the plurality of

rotational positions in (b). Claim 17 has also been amended in a manner similar to claim 1 to include determination of a parameter of a bed boundary away from a borehole.

Claim 20 has been amended to correct a grammatical error.

Claims 22 and 25-27 have been amended consistent with the amended language of claim 17.

Claim 28, and independent claim, has been broadened by replacing the term "resistivity sensor" with the broader term "first sensor." New claim 40 is dependent upon claim 28 and includes a resistivity sensor. Claim 18 has also been amended in (e) by addition of the term "spatial" to distinguish the position therein from the plurality of rotational positions in (c). Claim 28 has been amended in a manner similar to claim 1 by including determination of a parameter of a bed boundary away from a borehole.

Claim 30 has been amended to correct a grammatical error.

Claims 32, 34 and 35 have been amended consistent with the amended language of claim 17.

Claim 37 has been amended to provide a reference to the claim upon which it is dependent.

No new matter has been added by the amendments. Reconsideration of the application as amended is respectfully requested. The Examiner's objections and rejections are addressed in substantially the same order as in the referenced office action.

OBJECTIONS TO THE SPECIFICATIONS

The Examiner has objected to an incorrect reference to a figure number in the specifications. Paragraph [0018] has been amended to address the objection.

OBJECTIONS TO THE CLAIMS

The Examiner has objected to claim 37, a dependent claim, not referencing the claim upon which it is dependent. Claim 37 has been amended.

REJECTIONS UNDER 35 U.S.C. § 102

Claim 1 stand rejected under 35 USC § 102(b) over US 5,159,577 to *Twist*.
Claim 1 is an independent claim.

The present invention is a method and apparatus for use in a borehole in an earth formation for determining a property of a bed boundary away from the borehole. This is illustrated in the application in Figs. 6a, 6b and the related discussion. A novel feature of the invention is the use of a sensor with substantially no directional sensitivity, i.e., an axisymmetric response, to make this determination.

Twist teaches a method of correcting signals from a density logging tool on a drill collar eccentrically rotating within a borehole. As would be known to those versed in the art, a density logging tool has a gamma ray source and a plurality of detectors on one side of the tool. This is essential for proper operation of the tool since if the source and detectors were in the middle of the tool, the body of the tool would absorb the gamma rays from the source and also those reaching the detectors from the formation. The gamma ray density tool taught by *Twist* is thus a directionally sensitive tool. It is for this reason that the density measurements of the density tool as shown in Fig. 3 shows a sinusoidal variation synchronous with the tool rotation.

It is further stated in *Twist* at col. 5 lines 1-5 that:

"it should be understood that the technique of the present invention may be used to generate correction signals caused by eccentricity for various MWD sensors that produce signal variations as the tool rotates eccentrically within the borehole" (emphasis added)

In contrast, the first sensor used in the present invention is azimuthally insensitive. This is the reason why, as shown in Figs. 5a-5c there is a substantially circular sensitive zone for the directionally insensitive logging tool. The measurement made by the sensor will be the same regardless of the tool rotation angle as long as the center of the tool is at a substantially fixed spatial position relative to the center of the borehole. The present invention relies on the fact that even with the azimuthally

insensitive sensor, it is possible to infer something about the formation by tracking the formation evaluation measurements as a function of the spatial position of the eccentric tool.

In order for a claimed invention to be unpatentable under 35 USC § 102 over a prior art reference, the prior art reference must show each and every limitation of the claim arranged as in the claim. This is clearly lacking in the present case as *Twist* does not teach the use of a azimuthally insensitive, eccentric sensor for determination of formation properties. Accordingly, applicant respectfully submits that claim 1 is patentable under 35 USC § 102 over *Twist*.

Claims 2-16 and 38 are dependent upon claim 1 and are also patentable under 35 USC § 102 over *Twist* and the prior art of record for the same reasons that claim 1 is patentable under 35 USC § 102 over *Twist* and the prior art of record.

US2002/0117299 of *Hoaglund* et al., cited in an accompanying Supplementary Information Disclosure Statement, teaches a method of compensating for tool motion for a resistivity tool having an axisymmetric response. However, *Hoaglund*, like *Twist*, only teaches a method for obtaining a well log corrected for eccentricity of the tool. In contrast, the invention of claim 1 is directed towards determination of a parameter of a bed boundary away from the borehole. Such a determination is neither taught nor suggested in *Hoaglund*. Accordingly, applicant respectfully submits that claim 1 and

claims 2-16 and 38 that are dependent upon claim 1 are patentable under 35 USC § 102 over *Hoaglund*.

Applicant further submits that claim 1 is also patentable under 35 USC §103 over *Twist* and the prior art of record (including *Hoaglund* and US 5,014,412 to *Helm*). In order to sustain a rejection under 35 USC § 103, two requirements must be met. First, each and every limitation of the claimed invention must be present collectively in the prior art references. Secondly, there must be a suggestion in the references or a motivation to combine the references to come up with the claimed invention.

The first requirement is clearly not met here: *Helm* is directed towards navigation and surveying and does not teach the use of directionally insensitive formation evaluation sensors. As noted above, neither *Twist* nor *Hoaglund* teach the determination of a parameter of a bed boundary away from a borehole using measurements made by an azimuthally insensitive tool in the borehole. Accordingly, applicant respectfully submits that claim 1 and claims 2-16 and 38 are also patentable under 35 USC § 103 over *Twist*, *Hoaglund* and the prior art of record.

Claim 17 includes the substantive limitations of claim 1 discussed above, i.e., an axisymmetric formation evaluation sensor, and the determination of a parameter of a bed boundary away from a borehole. Accordingly, applicant respectfully submits that claims 17 and claims 18-27 and 39 that are dependent upon claim 17, are also patentable under

35 USC §§ 102-103 over *Twist, Hoaglund* and the prior art of record for the same reasons that claim 1 is patentable under 35 USC §§ 102-103 over *Twist, Hoaglund* and the prior art of record.

Claim 28 includes the substantive limitations of claim 1 discussed above, i.e., an axisymmetric formation evaluation sensor and determination of a parameter of a bed boundary away from a borehole. Accordingly, applicant respectfully submits that claims 28 and claims 29-37 and 40 that are dependent upon claim 27, are also patentable under 35 USC §§ 102-103 over *Twist, Hoaglund* and the prior art of record for the same reasons that claim 1 is patentable under 35 USC §§ 102-103 over *Twist, Hoaglund* and the prior art of record.

REJECTIONS UNDER 35 USC § 103


Claims 2-6, 14 and 15 stand rejected under 35 USC § 103 over *Twist* and further in view of US 5,012,412 to *Helm*. The patentability of claims 2-6, 14 and 15 has been addressed above in the discussion of the claim rejection under 35 USC § 102.

Claims 17-20, 24-30, and 34-37 stand rejected under 35 USC § 103 over *Twist* and *Helm*. The patentability of claims 17-20, 24-30 and 34-37 has been addressed above in the discussion of the claim rejection under 35 USC § 102.

The Commissioner is authorized to charge any fee due for the amendments herein
and to charge any deficiency to Deposit Account No. 02-0429 (414-28153-US)

Respectfully submitted,

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